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THIS PUBLICATION GIVES INFORMATION on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.

This issue contains:

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EXPERIMENTS WITH ZINC SULPHATE FOR THE CORRECTION OF "WHITE BUD" OF CORN OUTLINED IN FLORIDA REPORT

EDITOR'S NOTE:-The paper given here was prepared by Drs. Barnette and Camp expressly for use in this publication. It presents data which cannot but be of value to experimenters in the same and other lines where there is reason to believe that zinc sulphate might be of value.

By R. M. Barnette and J. P. Camp*
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There are approximately 600,000 acres of corn planted annually in Florida. While practically every county grows some corn, the largest acreage is planted in central and north Florida. In this major area a large proportion of the acreage is planted to corn and peanuts or corn and velvet beans, or some other crop combination. "White bud," a form of chlorosis has been known to be widely distributed in the corn fields of Florida for a number of years. No pathological organisms have been found to be the direct cause of the disease. All physical symptoms of the chlorosis point to a malnutrition of the corn plant.

Indications of "White Bud"

Light yellow streaks appear between the veins of the corn seedlings growing on affected soils shortly after emergence of the plants. Small white spots of inactive or dead tissue develop rapidly in the leaves, while small white areas which never develop chlorophyll are sometimes prevalent. The unfolding leaves in the buds of corn seedlings are often white to a very light yellow in color, giving rise to the use of the term "white bud" by farmers.

On severely affected areas, the seedlings seldom recover completely from the chlorosis. The older leaves die, while yellow to white leaves continue to unroll. Before the older leaves die, they become distorted with areas of dead tissue and are light slate to dark brown in color. These plants never attain average height and produce only distorted ears. The yields of corn on these areas are very irregular and unsatisfactory.

On less severely affected areas, the seedling stage of the chlorosis may develop quite generally over a field. However, as the plants attain some growth,. the symptoms of white bud may disappear and the corn produce fairly satisfactory grain yields. It has been observed that even this transitory seedling stage of the chlorosis may stunt the growth and decrease the yield of corn.

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Found on Most Soil Types

"White bud" may develop on practically all soil types. It becomes particularly severe in fields kept in culture year after year. Often on recently cleared, very sandy soils, the corn plants become chlorotic after one or two years of culture. Fallowing "white bud" land to indigenous weeds and grasses often is more effective in reducing the chlorosis in corn than using planted cover crops. This observation is probably one of the reasons for the long established system of soil management in Florida called "resting the land." Until recently the only practical and sure cure for "white bud" besides "resting the land" was the liberal use of animal manures.

In 1931, Mr. Harold Mowry of the Florida Agricultural Experiment Station observed the response of bronzed tung oil trees to the application of chemically pure zinc sulphate to acid mineral soils. The trees which had applications of zinc sulphate made to the soil, recovered from the symptoms of malnutrition called "bronzing" and produced a healthy growth. In 1933 following these observations, chemically pure zinc sulphate was included in a study of the effect of a large number of soil amendments on "white bud" of corn. At that time "white bud" was so severe in the fields of the Station farm that growing corn successfully became almost an impossibility. In these tests, 20 lbs. of chemically pure zinc sulphate ($ZnSO_4.7H_2O$) per acre applied in the row separately from but with a complete inorganic fertilizer mixture caused a complete recovery of "white bud" corn plants and gave satisfactory grain yields. The animal manures were also effective in correcting the chlorotic condition of the plants.

During the 1934 and 1935 growing seasons, a number of field experiments with zinc sulphate have been conducted on the Station farm and in cooperation with farmers in whose fields "white-bud" of corn was prevalent. Very satisfactory results have been obtained in these tests. The "white bud" condition has been corrected very generally by the application of zinc sulphate in the row before planting corn.

Increase in Yields

Corn yields were increased as much as 75% on severely affected fields when 12 lbs. of zinc sulphate (89% $ZnSO_4$) per acre were applied in the row before planting. In these tests, 10 to 20 lbs. of zinc sulphate commonly increased the grain yields as much as 30% where "white bud" had been prevalent. In other fields where none of the physical symtoms of "white bud" had been observed, the yield of corn was not affected by the zinc sulphate. The use of zinc sulphate on several large corn fields has given very satisfactory response in plant growth and increased grain yields.

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Zinc sulphate has been applied in the row before planting a number of other field crops on "white bud" land. Peanuts, oats, sugar cane, Napier grass, pearl millet, Crotalaria spectabilis, Crotalaria intermedia and cowpeas have responded favorably in increased yields to the application of 5 to 60 lbs. of zinc sulphate (89% $ZnSO_4$) per acre in the row before planting. A number of the problems attendant to the use of zinc compounds on Florida soils are being systematically investigated and progress reports will be issued at intervals.

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*Chemist and Assistant Agronomist respectively.

NITROGEN IN SOUTHERN AGRICULTURE DISCUSSED AT NATIONAL FERTILIZER ASSOCIATION MEETING

Editor's Note: In June, 1935, Director M. J. Funchess of the Alabama Agricultural Experiment Station gave an address, "Nitrogen in Southern Agriculture," before the Eleventh Annual Convention of The National Fertilizer Association. The following abstract was prepared to indicate the more important points made by Director Funchess. Reprints of the address may be obtained by writing the Agricultural News Letter, Room 9122 Du Pont Building, Wilmington, Delaware.

By F. W. Parker, Ammonia Department,
E. I. du Pont de Nemours & Company

Director Funchess points out the fact that southern soils are very deficient in nitrogen, phosphorus and potash. The demand for nitrogen by crops is so great that from a relative standpoint there is a greater deficiency of nitrogen than of phosphorus or potash. Nitrogen deficiency is usually the first cause of declining yields.

The deficiency of nitrogen in southern soils is due to the high annual rainfall and the warm climate with mild winters which favor the rapid decomposition of organic matter. Furthermore, the type of farming, mostly clean cultivated crops, favors the rapid decomposition of organic matter in order to make the nitrogen available to crops. If it is not utilized by crops, the nitrogen is leached from the soil.

The necessity of continuous use of fertilizers for cotton and corn is illustrated by data taken from the Sand Mountain Station. Cotton and corn fertilized with 600 pounds of 6-10-4 per acre produced a five-year average yield of 1445 pounds of seed cotton and 39.6 bushels of corn per acre. When the fertilizer was omitted the sixth year, the yields dropped to 324 pounds of seed cotton and 7.5 bushels of corn per acre. On corresponding plots receiving the 6-10-4 fertilizer the sixth year, the yields were 1474 pounds of seed cotton and 29.6 bushels of corn.

Need for More Nitrogen

In discussing the need for more nitrogen, Director Funchess makes the following statements:

"The fertilizer practice of today is of such a nature that it is quite probable that the supply of phosphoric acid and potash is adequate for the low yields

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that are usually obtained. On the other hand, the nitrogen content of the fertilizers used is so low that it is safe to say that nitrogen completely dominates and determines the crop yields of the humid section of the South."

He points out that the nitrogen content of fertilizers has increased somewhat in the past 10 years, but concludes that "..... The nitrogen content of mixed fertilizers is still much lower than it should be."

Results of extensive experiments are cited to show the increased yields obtained from fertilizers containing different percentages of nitrogen. In one series of experiments conducted at eight different places, an 0-10-4 fertilizer used at the rate of 600 pounds per acre produced a five-year average yield of 716 pounds of seed cotton and 15.9 bushels of corn; a 3-10-3 fertilizer produced 1013 pounds of seed cotton and 22.5 bushels of corn; while a 6-10-4 fertilizer, also used at the rate of 600 pounds per acre, produced 1241 pounds of seed cotton and 33.7 bushels of corn. In like manner, 1500 pounds of 0-10-6 produced a four-year average yield of 1.37 tons of cabbage and 54 bushels of potatoes per acre. When a 3-10-6 was used, the yields were 5.07 tons of cabbage and 116 bushels of potatoes, but the use of 6-10-6 increased the yields to 8.09 tons and 145 bushels.

In another experiment at the Sand Mountain Station, the best results were secured when a high-nitrogen fertilizer was used with vetch in a two-year rotation of cotton and corn. The five-year average yields from plots receiving 600 pounds of 0-10-4 per acre were 617 pounds of seed cotton and 11.9 bushels of corn. On the plots receiving 6-10-4 for both cotton and corn, the yields were 1386 pounds of seed cotton and 40.2 bushels of corn. However, when the cotton was fertilized with 6-10-4 and vetch turned under for corn which received an 0-10-4 fertilizer, the average yields were 1597 pounds of seed cotton and 56.0 bushels of corn.

In discussing fertilizer ratios, Director Funchess presents data to show that relatively few grades of fertilizers are needed for Alabama. The same grade is satisfactory for cotton in different sections of the state. The data indicate that most economic results are secured from the use of 600 pounds of 6-8-4 per acre. Other data are presented to show that only nitrogen should be applied to corn when it follows some other crop that has received a complete fertilizer.

In summarizing his paper, Director Funchess makes the following statement:

"The experimental results presented in this paper indicate that farmers in the humid section of the cotton belt might profitably use for cotton fertilizers that contain about twice as much nitrogen as the average mixed fertilizers now carry. It is further indicated that the per-acre application might be approximately doubled before an economic limit is reached."

SUGGESTIONS ON THE CARE OF FARM EQUIPMENT TO MAINTAIN ITS EFFICIENCY AND APPEARANCE

EDITOR'S NOTE: - How simple a matter it is to protect farm machinery and implements and the advantages of doing so are clearly and interestingly set forth in this article. Mr. Sheeler is well known for his knowledge and experience in the field of industrial plant paint maintenance.

By Roy C. Sheeler, Sales Technical Adviser,
Finishes Division, E. I. du Pont de Nemours & Co.

Where is the person who at one time or other has not driven or ridden through a prosperous farming community - Lancaster County in Pennsylvania, for instance - and has made a mental note of the attractiveness of the farms in general; the spic and span red and white barns; well-kept fences; neatly painted dwellings - and all of a sudden has seen the remains of an expensive piece of farm machinery, "parked" out in the open underneath a tree, exactly where the last user had left it! This is a discouraging, needless note of discord in the symphony of American farm life.

It is difficult to understand why farm machinery is allowed to "rust out" for the most part rather than "wear out." Every unit of such farm equipment has cost real, hard cash, earned by the sweat of long days and nights in laborious farm work. Some have taken months to pay for. And when the debt has been met, the service obtained has been but a fraction of what it was designed to do - all as a result of wilfull neglect in proper care and housing.

When I was a youngster my father had a small farm in the hills of upper Chester County in Pennsylvania. He was proud of the appearance of his place. He took good care of every piece of farm equipment. He would never permit the mowing machine, hay rake or any other machinery to remain out in the field one moment after he was finished using it. He provided dry, fully covered storage sheds for its housing over the winter. He oiled and greased every bearing before and after use. He kept all cutting surfaces sharp and keen. Furthermore, all equipment was maintained in good condition and appearance by periodical painting. I can well remember going to the "general store" and buying a quart each of red and green "machinery paint" and helping to clean up the farm wagon and paint it. All of the dirt, mud, grease, etc. had to come off; if it couldn't be scraped off readily it was washed off and the surface allowed to dry. We had no specially prepared "rust-inhibitive primers" in those days. Consequently after sand-papering rusted places and

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smoothing up the woodwork they were given a coat of red or green paint and allowed to go at that, along with the rest of the surface. But after years of service, up to the time when the farm was sold, his farm equipment was still in splendid shape and brought good prices.

There is no real excuse for the rapid deterioration of much of the costly farm machinery and its early replacement. Surely, adequate storage can be provided and the machinery placed under cover when no longer needed. Furthermore, good-looking equipment is a splendid asset in times of sale. And keeping it in good condition is so easy today that any owner can always have "new" machinery at little cost, if he so desires. Necessary surface preparation is essential, such as sand papering or scraping rusted metal down to a firm, hard surface. Cleaning wood sections from dirt, dust, and all parts from oil and grease before repainting is a requirement for good results.

There are rust-resisting primers available, which dry overnight and which prepare the surface for the finishing enamel coats. Most paint or hardware stores carry an assortment of enamel finishes in all wanted shades - light and dark gray, yellow, orange, vermilion, light and dark green, blue and black. One doesn't have to be an artist to transform a piece of shabby, miserable looking farm equipment into something to be proud of. And there are several types of enamel or paint finishes to choose from, depending upon the nature of the finish desired, its drying time, degree of gloss, etc. Among these are the spar varnish enamels, which dry overnight with a high gloss and good durability. Then there are the very modern, quick-drying synthetic finishes, which dry in 6 to 8 hours and possess very long life. The cost of either kind is nominal. A few hours of a man's time and a small investment for material and a good brush is a very low price to pay for the definite benefits obtained.

So, when you have finished with any piece of farm equipment, don't drag it over to a fence corner or let it lie under a tree over the winter. This is the quickest and easiest way to enrich the machinery maker and make you all the poorer. House it properly in a clean, dry place. Paint it frequently to prevent the accumulation of rust and the decay of wood surfaces. Such care of expensive farm equipment brings its own reward.

SEED DISINFECTION SHOWN BY NORTH DAKOTA TESTS TO CONTROL VARIOUS DESTRUCTIVE GRAIN DISEASES

EDITOR'S NOTE:- The findings given below are from a bulletin entitled "Seed Treatments" by W. E. Brentzel, Plant Pathologist, North Dakota Agricultural Experiment Station, Fargo, North Dakota.

Several destructive diseases of wheat, oats, barley and emmer may be completely controlled, and the damage from others greatly reduced by the use of seed disinfectants. In the past few years the experiment station has tested many different seed disinfectants. The results of these tests indicate that preparations such as Ceresan*, --- are very valuable as fungicides.

The New Improved Ceresan, containing 5% ethyl mercury phosphate, is an efficient disinfectant for smuts. This material is used as a dust at the rate of 1/2 ounce per bushel.

Ceresan is recommended for:

(a) Covered smut of wheat
(b) Covered smut of barley
(c) Barley stripe disease
(d) Oat smuts

Covered Smut of Barley - The Ceresan Treatment - Ceresan is effective in the control of covered smut and black loose smut of barley. Ceresan has given good results when used at the rate of 1/2 ounce per bushel.

Ceresan - In our experiments the most effective and convenient treatment for stripe was the Ceresan treatment.

Seed treatment with Ceresan, as recommended for the barley stripe disease, is beneficial in reducing the damage from seedling blight (Helminthosporium) which may originate from infected seed. Where the soil is infested with the disease organism seed treatment alone, however, cannot be expected to prevent seedling infection. Before treating all seed should be graded well to remove light and shrivelled seeds. These are apt to be diseased.

Ceresan Treatment - Ceresan is effective in reducing seedling blight when the scab organism is in the seed. The treatment as used for covered smut is recommended.

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* "Ceresan" is the trade name for the ethyl mercury phosphate dust developed and manufactured by the Bayer-Semesan Company, Wilmington, Del.

FOUR METHODS OF BLASTING BOULDERS APPROVED BY AGRICULTURAL ENGINEERS

EDITOR'S NOTE:- The development of practical and economical means to remove field boulders by blasting is one of the important contributions of agricultural engineers and explosives experts to agriculture. This article gives the essentials of blasting procedure.

By L. F. Livingston, Manager,
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E. I. du Pont de Nemours & Co.

Field boulders have no place on the well "engineered" farm. Tolerating these unnecessary obstructions and working around them adds to production costs. Permitting boulders to remain in fields is inconsistent with modern farm practices and wasteful at a time when agricultural engineers are making every effort to point out to farmers ways to reduce production costs.

It is an annoying fact that boulders sometimes appear in a field in the Fall of the year and are uncovered when plowing is done, despite the fact that the boulders were not in evidence the year before. This, of course, is due to the effect of frost "coming of the ground".

Efficiency and economy in the removal of boulders make necessary careful consideration of the method to use in blasting them. Not only must the kind of boulder -- ranging from granite "nigger-heads" to soft limestone -- be considered, but also the location and size of the boulder. As a result, the blaster must choose from among four methods.

Methods of Blasting

The simplest way to remove a boulder when it is on top of the ground is by mudcapping. This method is known by various other names, including "bulldozing," "blistering," "poulticing," "plastering" and "dobying."

Usually, the dynamite is removed from the cartridge wrappers and heaped on the top of the boulder. A blasting cap with fuse attached or an electric blasting cap is inserted in the mass.

Another way is to use whole or half cartridges, sometimes slitting the wrappers, and arranging the cartridges as compactly as possible. One of the cartridges is primed with a blasting cap and fuse. The primed cartridge should be placed in the center of the charge.

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In either case, the mass of dynamite is covered with several inches of thick, heavy mud. The mud should be packed firmly by hand. Care should be taken to see that the mud is free from pebbles or fragments of rock, for when the blast is fired they are likely to fly with great force for a considerable distance.

It is important that the charge of dynamite be placed at a point on the boulder that would be struck with a sledge hammer were it possible to break it by that means.

Mudcapping is the method frequently used when practically all of a boulder is above the surface of the ground. It is intended to shatter the rock.

Another method is called snakeholing. This is the method usually followed for blasting a boulder that is partly embedded in the ground.

For blasting by this method, the earth is dug out to permit loading the dynamite against or under the boulder.

All except one of the cartridges are slit in three or four places. These slits are made lengthwise of the wrappers. This permits packing the explosive in a solid mass against the rock. The cartridge which is not slit is primed with a blasting cap and fuse or an electric blasting cap. It is known as the "primer" cartridge.

The slit cartridges are pushed into place with a wooden tamping stick and firmly compressed. The primer is then inserted.

A small quantity of sand or dry earth is poured into the hole and gently tamped. More earth is placed in the hole and firmly tamped, this operation being continued until the hole has been filled to the surface. It is advisable to hold the fuse with one hand while doing the tamping so as to keep it straight.

Only a wooden tamping stick should be used. A metal tool is likely to cause a spark if it comes in contact with the rock.

Many blasters prefer to merely roll boulders out and then break them by mudcapping. However, a snake-hole blast can break up a boulder, provided the dynamite is loaded correctly.

Still another method is called the pop-out shot. It is somewhat similar to snakeholing. This is used where a boulder is in a very wet spot. Pop-out shooting is for the purpose of rolling the boulder out, so that it may be broken up, if desired, by mud-capping. Of course, this method will not roll a boulder out of a pond or for any considerable distance.

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A hole is made under the boulder similar to that under a stump either with a bar or auger; it is loaded in a similar manner. None of the cartridges should be slit. One is primed with an electric blasting cap. Fuse can not be used without risk of a misfire. If the hole fills with water tamping is unnecessary.

Blockholing is the oldest of the four methods of blasting boulders. It requires the drilling of a hole part way through the rock and loading it with a small amount of dynamite. Less of the explosive is required than for shooting by any of the other three methods. There is, however, the question of the cost of drilling. Very hard or large boulders can be broken up best by blockholing. It is the most approved method for blasting the nigger-head type.

Usually, one-quarter to a full cartridge of dynamite is loaded in the hole and tamped with sand or earth. The dynamite is, in some cases, removed from the wrapper and after it is packed in the hole a pointed wooden stick is used to make a hole in the explosive for the blasting cap. If a cartridge or a part of one is used, the blasting cap is inserted in the cartridge before loading.

Either a blasting cap and fuse or an electric blasting cap may be used for priming.

Rock blasting can be a dangerous operation unless the blaster is very careful to observe safety rules. For one thing, the fuse or the leading wires for electrical blasting should be sufficiently long to permit the blaster to take a safe distance.

Charges for Boulder Blasting

The best way to determine the amount of explosive to use -- where a number of boulders are to be removed -- is to make test shots. No definite rule can be laid down, since rock varies in toughness and hardness. Usually, it is better to use two or more charges when the stone is more than four feet thick. The shooting of two or more holes at one time makes necessary the use of electric blasting caps and a blasting machine. Below are suggested charges.

Thickness of Boulder Opposite Charge	Cartridges Mudcap Method	Cartridges Snakehole Method	Cartridges Blockhole Method
1½ feet	1-2	1	1/4
2 feet	2-3	1½-2	1/4
3 feet	4-5	3 -4	1/2
4 feet	6-8	5 -7	1

The above figures are based on 40 per cent Red Cross "Extra" dynamite.

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The Effects of a Dynamite Explosion

With every dynamite explosion, there are two distinct actions; the first is a very fast tearing, rending action, while the second is more of a heaving, slower action. The higher the percentage of the dynamite, the greater amount of the first action takes place.

When mudcapping a boulder, the first action is all that is utilized - the second action goes away in the form of noise. If water could be piled on top of the dynamite, it would give perfect confinement for the first action. Since a pile of water cannot be produced, a pile of mud is the best substitute, hence mud is used to pack on dynamite placed against the boulder.

In the snakehole method, however, the dynamite is again placed tight against the rock, but on the underneath side in a hole dug in the ground. Tamping is so placed that it will force the dynamite tight to the boulder. When this explosion takes place, the initial action breaks the boulder and the secondary action throws out the pieces. There should be practically no noise in a snakehole blast if it is correctly loaded. It is a proven fact that if there are 2 or 3 inches of dirt between the load and the bottom of the boulder that cushion of earth will absorb the first action and the secondary action will throw out the boulder without breaking it.

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